

What is claimed is:

1. A low transport efficiency alkali metal ion permselective membrane characterized by less than about 60% efficiency for the transport of alkali metal ions.

2. The membrane of claim 1, wherein said membrane has less than about 50% transport efficiency for alkali metal ions.

3. The membrane of claim 2, wherein said membrane has less than about 20% transport efficiency for alkali metal ions.

4. The membrane of claim 1, comprising a polymer having cation exchange groups.

5. The membrane of claim 4, characterized by high hydrogen ion transport efficiency.

6. The membrane of claim 5, wherein said cation exchange groups are selected from the group consisting of carboxylic acid groups and sulfonic acid groups and said polymer is a copolymer of tetrafluoroethylene and chlorotrifluoroethylene.

7. The low transport efficiency alkali metal ion permselective membrane of claim 3, comprising said membrane having high hydrogen ion transport efficiency and said membrane having cation exchange groups selected from the group consisting of carboxylic acid and sulfonic acid groups.

8. An electrolytic cell for the production of an alkali metal halate, said cell comprising a low alkali metal ion transport efficiency permselective polymer membrane and a catalytic, metal anode and a catalytic, metal cathode or a catalytic, metal anode and a gas-diffusion cathode.

9. The electrolytic cell of claim 8, wherein said permselective polymer membrane has less than about ^{60% JRS 19-JUN-03 m2 6/19/03} ~~80%~~ alkali metal ion transport efficiency.

10. The electrolytic cell of claim 9, wherein said permselective polymer membrane has less than about 50% alkali metal ion transport efficiency.

11. The electrolytic cell of claim 10, wherein said permselective polymer membrane has less than about 20% alkali metal ion transport efficiency.

12. The electrolytic cell of claim 9, wherein said catalytic, metal anode comprises a precious metal oxide deposited on a ~~nickel~~ or titanium substrate.

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13. The electrolytic cell of claim 12, wherein said catalytic, metal cathode comprises a precious metal oxide deposited on a nickel or titanium substrate.

14. The electrolytic cell of claim 9, wherein said cathode is a gas-diffusion cathode.

15. The electrolytic cell of claim 9, wherein said catalytic, metal cathode is selected from the group consisting of alloy mixtures of nickel-molybdenum, cobalt molybdenum, nickel-tungsten, cobalt-tungsten, nickel-iron, and nickel-cobalt on a nickel or steel substrate.

16. The electrolytic cell of claim 9, wherein said catalytic, metal cathode comprises an alloy coating of molybdenum, vanadium, and nickel on a copper substrate.

17. The electrolytic cell of claim 8, wherein said polymer membrane is characterized by less than about 20% alkali metal ion transport efficiency, high

hydrogen ion transport efficiency, and cation exchange groups selected from the group consisting of carboxylic acid and sulfonic acid groups.

18. An electrolytic cell for the production of an alkali metal halate, said cell comprising an hydrophilic, microporous diaphragm and a catalytic, metal anode and a catalytic, metal cathode or a catalytic, metal anode and a gas-diffusion cathode.

19. The cell of claim 18, wherein said hydrophilic, microporous diaphragm comprises a polymeric or ceramic material.

20. The cell of claim 19, wherein said microporous diaphragm comprises a polymeric material selected from the group consisting of a fluorinated polymer and a fluorinated copolymer.

21. The cell of claim 19, wherein said microporous diaphragm comprises a ceramic material selected from the group consisting of microporous titanium oxide and microporous zirconia.

22. The cell of claim 19, wherein said hydrophilic, microporous diaphragm is characterized by a pore size of about 0.005 micron to about 1 micron.

23. The cell of claim 22, wherein said hydrophilic, microporous diaphragm is characterized by a porosity of about 50% to about 85%.

24. The cell of claim 19, wherein said catalytic, metal anode comprises a precious metal oxide deposited on a ~~nickel~~ or titanium substrate. *TANTALUM JRT 19-JUN-03 m2 6/19/03*

25. The cell of claim 24, wherein said catalytic, metal cathode comprises a precious metal oxide deposited on a nickel or titanium substrate.

26. The cell of claim 19, wherein said cathode is a gas-diffusion cathode.

27. The cell of claim 24, wherein said catalytic, metal cathode is selected from the group consisting of alloys of nickel-molybdenum, nickel-tungsten, nickel-iron, nickel-cobalt, cobalt-molybdenum, nickel-iron, nickel-cobalt, and cobalt-tungsten on a nickel or steel substrate.

28. The cell of claim 24, wherein said catalytic metal cathode comprises an alloy of molybdenum, vanadium, and nickel coated on a copper substrate.

29. The electrolytic cell of claim 18, comprising an hydrophilic, microporous diaphragm comprising a polymeric or ceramic material having a pore size of about 0.005 micron and a porosity of about 50% to about 85%, a catalytic, metal anode, and a catalytic, metal cathode or a gas-diffusion cathode.

30. A continuous, cyclic, electrolysis process for the production of an alkali metal halate in which the addition of chromium ions and externally supplied acids or alkalies are eliminated, said process comprising:

A. electrolyzing in an anolyte compartment of an electrolytic cell an anolyte comprising an alkali metal halide and halate, said anolyte separated from a catholyte in a catholyte compartment by a low alkali metal ion transport efficiency permselective membrane characterized by less than 60% transport efficiency for alkali metal ions,

B. maintaining the pH in said anolyte compartment at about 6 to about 7 by adding a sufficient amount of said catholyte to said anolyte compartment, and

C. electrolyzing said anolyte to a desired aqueous solution of an alkali metal halate from which said alkali metal halate can be directly crystallized.

31. The process of claim 30, wherein said catholyte comprises an alkali metal chloride and an alkali metal chlorate which are added to said anolyte compartment of said cell by addition of said catholyte to an anolyte recycle process stream from which chlorine is absorbed and oxygen is separated and said stream is recycled to said anolyte compartment.

32. A continuous, cyclic, electrolysis process for the production of an alkali metal halate in which the addition of chromium ions and externally supplied acids or alkalies are eliminated, said process comprising

A. electrolyzing in an anolyte compartment of an electrolytic cell an anolyte comprising an alkali metal halide and halate, said anolyte separated from a catholyte in a catholyte compartment by a microporous, hydrophilic diaphragm characterized by a pore diameter of about 0.005 micron to about 1 micron, wherein said catholyte compartment is maintained at a differential pressure of about 1 inch to about 48 inches of water over the pressure maintained in said anolyte compartment,

B. maintaining the pH in said anolyte compartment at about 6 to about 7 by adding a sufficient amount of said catholyte to said anolyte compartment, and

C. electrolyzing said anolyte to a desired aqueous concentration of alkali metal halate from which said alkali metal halate can be directly crystallized.

33. The process of claim 32 wherein said catholyte comprises an alkali metal chloride and an alkali metal chlorate which are added to said anolyte compartment of said cell by addition of said catholyte to an anolyte recycle process stream from which chlorine is absorbed and oxygen is separated and said stream is recycled to said anolyte compartment.